

## SECTION 16220

### CONDUCTORS

#### PART 1 - GENERAL

- 1.1 Provide a complete system of conductors as indicated or necessary to accomplish the required connections. All conductors shall be installed in a neat and workmanlike manner, with care being taken that conductors are not kinked, scarred, or damaged during installation.

#### PART 2 - PRODUCTS

##### 2.1 CONDUCTORS AND INSULATION

- A. Wire and cable shall be soft drawn, annealed copper with 600 volt insulation. Minimum wire size shall be #12 AWG. Insulation for conductor sizes #12 and #10 shall be type THHN-THWN, THW or RHW for installation in ordinary dry locations and type THWN or RHW-2 for installation in wet locations. Wet locations shall include service conduits, conduit underground, raceways installed in concrete floor slabs in direct contact with the earth and raceways regularly subject to moisture or condensation. Conductors sizes larger than #10 shall have type XHHW-2 insulation. Conductors No. 8 AWG and larger diameter shall be stranded. Conductors No. 10 AWG and smaller diameter shall be solid, except that conductors for remote-control and signal circuits, classes 1, 2, and 3, may be stranded.
- B. Branch circuit conductors in fluorescent fixture raceways and drops to single fluorescent fixtures shall be type THHN or XHHW.
- C. Provide a separate ground conductor in all raceways sized in accordance with the N.E.C.

##### 2.2 COLOR CODING

- A. All branch circuit, feeder and control wiring shall be color coded in accordance with NEC. Color shall be integral with sheath for sizes 12 through 8. Provide minimum 1/2 inch wide color coded plastic tape strips for conductors size 6 and larger. Strips shall be placed minimum 6 inches on center in all panelboards, junction boxes, pull boxes, conduit fittings, disconnect switches and anywhere the conductors are accessible and visible. Wire shall be color coded as noted below. All other conductors shall be of other colors. Color schedule shall be as follows:

| <u>208/120 Volt<br/>System</u> |       | <u>480/277 Volt<br/>System</u> |        |
|--------------------------------|-------|--------------------------------|--------|
| Phase A                        | Black | Phase A                        | Brown  |
| Phase B                        | Red   | Phase B                        | Orange |
| Phase C                        | Blue  | Phase C                        | Yellow |
| Neutral                        | White | Neutral                        | Grey   |
| Ground                         | Green | Ground                         | Green  |

## 2.3 ALUMINUM CONDUCTORS

- A. Electrical designs are based on copper wire and cable. If at option of the Contractor, aluminum or copper-clad aluminum is selected for cables No. 6 AWG or larger, equivalent aluminum or copper-clad aluminum conductor sizes shall be selected and provided by the Contractor. Additionally, all adjustments in raceway and pull box sizes shall be the responsibility of the Contractor.
- B. The manufacturers of certain air conditioning system components and certain other equipment place restrictions and prohibitions on the use of aluminum conductors in their equipment. Before adopting the option of using aluminum or copper-clad aluminum conductors to feed this equipment, the Contractor must check for such restrictions and prohibitions and abide by them. No requests for extra compensation for changing conductor type in these circuits will be considered.

## 2.4 JOINTS AND TERMINATIONS

- A. Leave at least 6 inches of free conductor in each outlet- or junction- box for making up joints and making connections to fixtures, devices or equipment.
- B. For conductors #12 and #10 all fixture and branch circuit joints in junction and outlet boxes shall be made with UL listed pressure type connectors rated at 600 volts and 105 degrees C. Connector body shall consist of a cone-shaped, expandable, square-edged, coil-spring insert, insulated with a color-coded, self-extinguishing nylon shell with two wings placed opposite to each other to serve as a "built-in" wrench. Shell shall be molded of one piece. Connectors shall be IDEAL INDUSTRIES "Wing-Nut" or BUCHANNAN "B-CAP", 3M "SCOTCH-LOK" connectors or equal. Wire #8 and larger shall be joined or terminated with solderless pressure connectors properly taped in layers to form a moisture-tight joint.

## PART 3 - EXECUTION

### 3.1 CONDUCTOR INSTALLATION, GENERAL

- A. Conductors shall be continuous from outlet to outlet, and no splices shall be made except within outlet or junction boxes. Junction boxes shall be provided where required. Home runs may be combined in one conduit, provided all connections are in accordance with NEC requirements and the maximum unbalanced current in the neutral does not exceed the capacity of the conductor. All parallel feeder runs shall be laid out and cut to exact same lengths before pulling into conduits to insure load balance. No additional trimming of parallel conductors will be accepted. Conductors #8 and smaller shall be pulled by hand and without aid of block and tackle or other mechanical device. Only approved equipment for pulling conductors shall be used for #6 and larger conductors. Only approved pulling compounds which will in no way damage the insulation on the conductors or hasten its aging may be used to facilitate pulling of wire into conduit. Circuiting shown shall be followed unless specific changes are approved by the Engineer.
- B. Where several feeders pass through a common pull box or junction box, the feeders shall be tagged to indicate clearly their electrical characteristics, circuit number, and panel designation. This same information shall be permanently marked on cover of the box.
- C. All conductors shall be in conduit unless otherwise indicated or allowed.

- D. All conductors and cables shall be labeled.

### 3.2 ALUMINUM CONDUCTORS INSTALLATION

- A. If at the option of the Contractor, aluminum wire and cable is selected, conduits and boxes shall be increased in size to accommodate increased wire sizes. Contractor shall use particular care in making up joints and terminations. Surface oxides shall be removed by cleaning with a wire brush or emery cloth. Oxide-inhibiting joint compound shall be used on conductors and UL listed solid aluminum connectors shall be used for connecting aluminum to aluminum. Where connecting aluminum to copper, connectors specifically designed for this purpose shall be used. If aluminum conductors are used for branch wiring, panelboard branch circuit load connectors as well as equipment and device terminals shall be specifically designed for use with aluminum conductors. If aluminum conductors are used for feeders, panelboard main connections and dry type transformer connections as well as main switchboard branch circuit connections shall be made by attaching a compression lug to the conductor with a high pressure, hand or hydraulic tool, with dies to match conductors and lug size, all designed to produce a cold flow bonded joint. Terminations under set-screw lugs in panelboards, disconnect switches, et., shall be made with BURNDY "Hyplug" plug type compression sleeve compression connectors. Bolt stud connections shall be made with one hole spade compression lugs. The use of wing-nuts and aluminum conductors terminating under set screw type connections are disallowed. If the Contractor elects the use of aluminum wire and cable, he shall be responsible for providing panelboard, switchboard and equipment cabinets of sufficient size to accommodate the aluminum conductors and to allow adequate space for bending, training and terminating them.

END OF CONDUCTORS